

Hijacking cell signalling pathways with magnetic nanoactuators for remote-controlled stemcell therapies of neurodegenerative disorders

<https://neurodegenerationresearch.eu/survey/hijacking-cell-signalling-pathways-with-magnetic-nanoactuators-for-remote-controlled-stemcell-therapies-of-neurodegenerative-disorders/>

Principal Investigators

Institution

Contact information of lead PI

Country

European Commission

Title of project or programme

Hijacking cell signalling pathways with magnetic nanoactuators for remote-controlled stemcell therapies of neurodegenerative disorders

Source of funding information

European Commission Horizon 2020

Total sum awarded (Euro)

€ 3,473,026

Start date of award

01/01/2016

Total duration of award in years

4.0

The project/programme is most relevant to:

Parkinson's disease & PD-related disorders

Keywords

Research Abstract

Neurodegenerative diseases, such as Parkinson's disease, are a major public health issue given the aging population in Europe and beyond. While curative pharmacological treatment of these diseases is not in sight, cell replacement therapies (CTs) are considered very promising, in particular with the advent of stem-cell reprogramming

technologies. However, a fundamental challenge in the medical application of CTs in the brain of patients lies in the lack of control of cell behaviour at the site of transplantation, and particularly their differentiation and oriented growth. The aim of this project is to introduce a fundamentally new concept for remote control of cellular functions by means of magnetic manipulation. The technology is based on magnetic nanoparticles functionalized with proteins involved in cellular signalling cascades. These biofunctionalized MNPs (bMNPs) will be delivered into target cells, where they act as intracellular signalling platforms activatable in a spatially and temporally controlled manner by external magnetic fields. The project will focus on engineering these tools for the control of neuronal cell programming and fibre outgrowth by hijacking Wnt and neurotrophin signalling, respectively, with the ultimate objective of advancing cell replacement therapies for PD using dopaminergic precursor neurons.

To achieve this ambitious goal, we have gathered an interdisciplinary consortium interfacing scientists having cutting-edge know-how in bMNP engineering, surface functionalization and cellular nanobiophysics with renowned experts in neuronal cell differentiation, stem-cell reprogramming and regenerative (nano-)medicine. By exploiting this complementary expertise, a novel, versatile technology for magnetic control of intracellular signalling is envisaged, which will be a breakthrough for remote actuation of cellular functions and its successful implementation in CTs for neurodegenerative diseases and injuries within the following decade.

Lay Summary

Further information available at:

Types:

Investments > €500k

Member States:

European Commission

Diseases:

Parkinson's disease & PD-related disorders

Years:

2016

Database Categories:

N/A

Database Tags:

N/A